Germany and the United States. But if, instead of using Mr. Levinstein's figures, we take the annual exports per head of population, which is after all the truest test, we find that in the period 1870–74 they were 7*l.* 7*s.* 3*d.* per head, but in 1895–99 they had fallen to 5*l.* 19*s.* 5*d.* In Germany during the same periods they were 2*l.* 16*s.* 7*d.* and 3*l.* 7*s.* 2*d.* respectively, while in the United States they rose from 2*l.* 9*s.* 11*d.* to 2*l.* 18*s.* 4*d.* These figures show that although per head of population we export more than either of these nations, yet during the last forty years they have been increasing their exports per head, but those of the United Kingdom have been declining. The figures are much more striking if at the same time we examine the increase of population which has taken place in the three lands during the same period. From 1871 to 1901, the population of the United Kingdom increased by 31·7 per cent., while that of Germany increased 37·3 per cent. and that of America 96·1 per cent.[1]

I will now take another comparison—the five years' averages of the annual exports at the beginning and end of the period 1880–1900. Here it will be seen that the increase of exports of the United Kingdom only amounted to 6·4 per cent. (234 to 249 millions), but that Germany showed an increase of 23·1 per cent. (156 to 192 millions) and the United States 42·8 per cent. (166 to 237 millions).

Again, we are unable to show such large increases in the quantity of pig iron produced as are Germany and America. In the years 1870–74, the United Kingdom was far and away ahead of all other nations, producing 6·4 million tons against 1·8 million tons by Germany and 2·2 million tons by America. But in 1896–1900, the amounts were for the United Kingdom 8·9, Germany 7·4, and America 11·5 million tons.

Mr. Evershed objects to Mr. Levinstein taking a "fat year" as the starting point for his statistics, but, as I have already pointed out, the years 1899 and 1900, which come within Mr. Levinstein's decade, were also exceptionally good years and thus help to bring up the average. But I think that although Mr. Evershed has taken exception to the use of the year 1890, he will agree with all scientific and broad-minded men in being glad that a man of Mr. Levinstein's experience should have the courage to speak out and try to wake the nation up to a sense of its responsibilities.

F. MOLLWO PERKIN.

Bipedal Locomotion of Lizards.

I KEPT for many years in a glass case some specimens of *Lacerta viridis*, and often observed them after a feed playing in the sunlight in a peculiar manner, first drinking water, which they lapped up with their wide forked tongues. The play was a sort of dance. The lizard stands on his hindlegs and, raising the fore part of his body, executes a rapid, playful waving of the forelegs. When both forelegs are used, they move in unison; sometimes, however, only one is employed. This action seemed to be meant as an attraction, the motions being performed facing another lizard, who often responded with answering waves of the forelegs; at times during the pastime, the pair would lick each other. I observed the females indulged oftenest in this coquettish dance, though the males would go through the same performance, strange to say, as often with each other as with a female for a partner to set to.

One female I kept for five years always, when excited, took a perpendicular position, progressing on her hindlegs with the fore part of the body lifted, and would play, running at my hand and biting, always in that erect pose.

The blue lizards of Capri, which I have kept for years in confinement, move along upright under excitement, also using bipedal action.

ROSE HAIG THOMAS.

September 23.

RUDOLPH LUDWIG KARL VIRCHOW.

"All that lives must die,
Passing through nature to eternity."

THE great master and founder of modern pathology, Rudolph Virchow, has passed away, full of years and full of honours, mourned, not only by his fellow countrymen, but by the whole scientific world. A fall early in January last resulting in a fractured thigh was the ultimate cause of his death, which occurred on September 5.

[1] In Germany and America, the census returns are for 1900.

Born at Schilvelbein in Pomerania in 1821, Virchow attended the public school of his native town until his thirteenth year, when he entered the gymnasium of Cöslin and early distinguished himself by his linguistic attainments. In 1839, he entered the Friedrich-Wilhelm Institut, a training college for army medical officers, having among his teachers Müller and Caspar and among his fellow students Helmholtz, and in 1843 proceeded to take his degree. He had already shown such promise that he was released from service with the army and was attached to the Charité Hospital as prosector of anatomy, acting as assistant to Froriep, whom he succeeded in 1846. About this time he founded, in collaboration with Reinhardt, the famous *Archiv*, and after the death of the latter continued to edit it himself. In 1848, he carried out an investigation into an epidemic of relapsing fever in Silesia, and so uncompromising were his strictures on the authorities, together with his alliance to the ultra-Radical party, that he was compelled to resign his appointment at the Charité. Already, however, his reputation as a pathologist was made, and he was immediately offered and accepted the chair of pathology at Würzburg, where for the next seven years he devoted himself to pathological research. In 1856, on the death of Hemsbach, the Faculty of the University of Berlin petitioned for his recall, and, in spite of bitter opposition, was successful in its application, and Virchow returned to his old University for the remainder of his life, founding the Pathological Institute and the Museum of Morbid Anatomy.

Virchow's life was a strenuous one, and being blessed with a wonderful constitution he was able to devote himself to, and to become a master in, many pursuits, any one of which is usually sufficient to fill the life of ordinary mortals. In addition to his pathological chair, the duties of which he fulfilled up to the time of his accident, he was ethnologist and anthropologist, archæologist and Egyptologist, politician, a member of the Berlin Municipal Council for forty years, a member of the Prussian Chamber from 1862 to 1878, where he was the recognised leader of the Radical party and for fifteen years chairman of the Finance Committee. In 1880, he was elected a member of the Imperial Reichstag, but took little active part in its debates. One of his most important public works was concerned with the introduction of a system of drainage and with the installation of sewage farms, whereby Berlin has become one of the healthiest cities of Europe.

Of the man it may be said that he was beloved by his family and by his intimates. Short of stature and spare of figure, with grizzled hair and piercing grey eyes covered with spectacles, his was not a striking personality. Nor was he an orator, having a somewhat thin and weak voice and impassive delivery, but what he said was always to the point and clothed in simple but logical language, and he compelled a hearing by his very earnestness and simplicity. His political views and his uncompromising manner of stating them unquestionably prevented a full measure of State recognition of his genius.

As a teacher he attracted students from all parts of the world. Until his time, autopsies had been performed in a very perfunctory manner, the supposed seat of disease alone being examined. Virchow, however, submitted all the organs and tissues to a careful scrutiny, thereby in course of time as data accumulated proving the interdependence of one condition upon another and showing how widespread might be the effects of a limited lesion. At his demonstrations, the specimens were subjected to a rapid description and criticism, rough sections were cut and placed under the microscope, which was mounted upon a trolley running on rails, and so could be submitted without disturbance to the scrutiny of each member of the class. Drawings of the specimens

were made upon the blackboard and the salient features indicated, and in the course of a demonstration six or eight specimens might thus be started on the tour of inspection.

Of his pathological work, the earliest was upon vascular disorders. He was the first to elucidate the true nature of phlebitis, thrombosis and embolism, to recognise the essential features of leukæmia and to distinguish this condition from pyæmia, so laying the foundation for the brilliant work of Ehrlich and others upon hæmatology. In 1858, his "Cellular Pathology" appeared, in which the theory that every cell arises from a pre-existing cell was enunciated and the cellular derivation of the connective tissues, bone and cartilage recognised. Up to this time, the humoral theory had dominated medicine, but these considerations revolutionised pathology by introducing the new conception that all pathological cell-formations must arise from pre-existing normal cells. He says in his lectures, "The question is whether the general types which we have established for the physiological tissues will also be found to hold good for the pathological ones. To this I unreservedly reply, yes; and however much I herein differ from many of my living contemporaries, however positively the peculiar (specific) nature of many pathological tissues has been insisted upon during the last few years, I will nevertheless endeavour to furnish you with proofs that every pathological structure has a physiological prototype and that no form of morbid growth arises which cannot in its elements be traced back to some model which had previously maintained an independent existence in the economy."

Harvey had enunciated the celebrated proposition *Omne vivum ex ovo*, subsequently found to be too narrow to apply to all living forms; to Virchow pathology and physiology are indebted for the not less striking dictum, *Omnis cellula e cellulâ*. By this his name will live through the ages. Another great work of his was that on tumours, unfortunately never completed. He showed that cartilaginous tumours of bone might start from islands of cartilage which had remained untransformed during the general ossifying process, and thus gave some support to Cohnheim's theory of the origin of tumours from embryonic remains. He further made contributions on tuberculosis and leprosy, trichiniasis, hydatid tumours of the liver, lardaceous disease, cholera and diphtheria, and animal pigments; in fact, it is no exaggeration to say that there is hardly any subject in pathology that has not been illumined by some important contribution of his. He was a pathological anatomist and histologist rather than an experimental pathologist, and pathological bacteriology was of too recent development for him to contribute to it extensively. It is true that he made mistakes—he was but mortal; for example, his theory of the dependence of chlorosis upon anatomical defects in the circulatory organs has been found untenable—but he was the first to recognise them, and as often as not himself destroyed the fabric he had previously erected.

Virchow's fame was world-wide, and honours of all kinds were showered upon him. In 1874, he became a member of the Royal Academy of Science of Berlin; at the centenary of the Institute of France he was made a Commander of the Legion of Honour, and the following year Foreign Associate of the French Academy of Sciences. A foreign member of our Royal Society, he was Copley medallist in 1892 (an honour he highly appreciated) and Croonian lecturer in 1893. The subject of his discourse, delivered in English, on this occasion was "The Position of Pathology among the Biological Sciences" (NATURE, vol. xlvii. p. 487). In 1898, his last visit to us, he delivered the Huxley lecture at Charing Cross Medical School, and he was afterwards entertained at a banquet, at which Lord Lister presided. The title of the Huxley lecture was "Recent Advances in Science and their Bearing on Medicine and Surgery," and to the last he retained his marvellous vitality of mind and kept abreast of the most recent advances in pathology. Last year, on the occasion of his eightieth birthday, he was the recipient of congratulatory addresses from all parts of the world, Lord Lister representing the Royal Society and other learned bodies of Great Britain and Ireland, and his reply, which occupied nearly two hours in delivery and was brimful of dates and facts, was given without a note.

His countrymen rightly accorded him a public funeral, and representatives of the State, the city, the university and of the learned societies accompanied his remains to their last resting place.

Space forbids anything but this brief sketch of Virchow's life, but as a writer in the *Lancet* well says, "His active work ceased only with his death, the world's appreciation of his worth remains." R. T. H.

THE ABEL FESTIVAL IN CHRISTIANIA.

THE centenary of the birth of the famous Norwegian mathematician Henrik Niels Abel was celebrated in Christiania by a festival, or rather a series of festivals, which lasted from September 4 to 7, to which delegates from all the more important scientific societies and universities of the world were invited. The festival aroused the interest of the people of Christiania in a very unusual degree and, indeed, appeared to be regarded in the light of an important national event; the presence of the King of Sweden and Norway, who made a special journey from Stockholm for the purpose, contributed in a high degree to emphasise the importance attached to the festivities by the whole population of the Norwegian capital. The festival was inaugurated by an informal reception of the delegates at a supper-party given on the evening of September 4 at St. Haushangen, a place of popular resort on the outskirts of Christiania. The company was received by the famous Arctic explorer, Dr. Nansen, president of the reception committee, by the Foreign Minister Lagerheim, the Ministers of State Blehr and Ovam, the president of the Storthing, and Prof. Mohn, president of the Christiania Academy of Science. In a bright and genial speech delivered in English, Dr. Nansen welcomed the foreign delegates and expressed the feeling of pride on the part of his own small nation in having through Abel made an important contribution to the essentially international work of the development of science and of civilisation. The formal part of the festival commenced at noon on September 5 in the Hall of the Municipality; the King and his son Prince Eugen arrived shortly after noon, and were received by a guard of honour, consisting of students of the University of both sexes. The ceremony consisted of the performance of a cantata written by the celebrated author Björnson, and of speeches which were made between the first and second parts of the cantata. Speeches were delivered by the Minister of State Blehr in French, by Prof. W. C. Brogger in German, and on behalf of the delegates by Prof. H. Weber, of Strassburg, and Prof. Volterra, of Rome. A detailed appreciation of Abel's work was given by Prof. L. Sylow. In the evening, the delegates had the honour of being invited by the King to a reception and supper at the Castle, when a large and distinguished company was present; many of the delegates were presented to the King, who conversed freely with them in their own languages. The second part of the festival was held on September 6, at noon, in the Hall of the University, the King and Prince Eugen being again present. The proceedings commenced with an address in French by Prof. Mohn. Speeches were then delivered by Prof. Forsyth on behalf of the English-speaking delegates; by Prof. Gravé on behalf of the Slav nations; by Prof. Picard, Prof. Schwarz, Prof. Zeuthen, Prof. Henzel